DOCUMENT RESUME

ED 082 996 SE 016 811

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TITLE	SMEAC Newsletter, Mathematics Education, Volume 5, Number 3.
INSTITUTION	ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, Columbus, Ohio.
PUB DATE	73
NOTE	6p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	Curriculum; *Instruction; *Mathematics Education; *Newsletters; Research; *Research Reviews (Publications); *Secondary School Mathematics; Teaching Techniques
IDENTIFIERS	ERIC SMEAC

ABSTRACT

This newsletter summarizes findings from the research on secondary school mathematics published during 1972 that might be used by teachers. Covered is research on the role of materials, mathematics laboratories, computers and calculators, informing students of objectives, student computational achievement, course organization patterns, personality characteristics affecting mathematics learning, and teaching strategies. A list of 26 references in included. (DT)

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NEWSLETTER

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

Mathematics Education — Volume 5, Number 3, 1973

ED 082996

Research on Secondary School Mathematics, 1972

Questions about what, when, or how to teach mathematical topics and ideas arise every day. Researchers as well as teachers (and remember: most researchers are teachers, too!) try to find answers to such questions. This review presents some of these investigations which were published during 1972. (For reports of such research in previous years, see Suydam, 1972a and 1972b). In selecting these studies, the primary criterion was: do the findings have meaning for the teacher—that is, are the findings applicable in the classroom? Studies whose findings would appear to be of interest primarily to other researchers are not included.* Other criteria involved evaluation of the research report: how carefully the research was designed and carried out was considered.

See if any of your questions have been explored!

Materials: What Helps Whom?

In a review of research on the role of materials, **Fennema** concluded that research appears to indicate that the ratio of concrete to symbolic models used to convey mathematical ideas should reflect the developmental level of the learner. Thus, alternative models should be available so the learner can select the most meaningful one for him.

Researchers continue to explore such alternatives, as well as the role of materials **per se**. For instance, in a study involving 65 geometry students, **Waters** found that there were no significant achievement or attitude differences between groups using circular geoboards, the geosheet (a two-dimensional version of the geoboard), or "conventional classroom methods."

Kuhfittig looked at the role of materials in relation to "guided discovery" learning. He selected 40 seventh graders at two achievement levels, and randomly assigned them to four groups using (1) either intermediate or maximal guidance and (2) either abstract or concrete materials, for a two-day unit on currency conversion. The intermediate guidance groups had a carefully structured sequence of questions, while the maximal guidance groups had careful explanations of individual steps. Low-ability students who used concrete materials achieved better than low-ability students who did not use materials; no difference was found between high-ability students. For intermediate-guidance groups, mean transfer-test scores for students using concrete aids were higher than scores of those not using aids; no difference was found for maximal-guidance students.

Shoecraft investigated the effects of three instructional approaches on translating selected types of algebra word problems: direct translation, high imagery with materials, and high imagery with drawings. Twelve seventh-grade mathematics classes and ten ninth-grade algebra classes spent eight days on differential treatments of number, coin, and age problems, and four days on identical treatment of work and mixture problems. It was concluded that, except for low achievers who seemed to derive particular benefit from representing problems with materials, students taught to translate directly performed comparably to those experiencing material referents and superior to those experiencing pictorial referents. Shoecraft added: "Thus the popular assumption that materials and/or pictorial representation of mathematics in and of itself enhances mathematics learning is perhaps unjustified. To expect such representation to facilitate mathematics learning is to assume that the mathematics implicit in the use of materials and drawings is descriptive of what is going on in the heads of students. The disparity between the two was evident in this study."

Mathematics Laboratories: How Effective?

Research reflects continued concern with the effectiveness of a laboratory or activity approach. **Vance and Kieren** reported on a ten-week investigation of the effectiveness of laboratory activities used once a week in grades 7 and 8. In the Mathematics Laboratory Group, students worked in groups of two, with written instructions and physical materials to help them discover concepts or relationships, then did practice exercises. In the Class Discovery Group, the same content was used, but the teacher demonstrated with concrete materials, leading the group to discover. The Control Group had the regular program with no laboratory work.

No significant differences were found in achievement of content covered in the regular program, even though class

† Prepared by Marilyn N. Suydam, Faculty Research Associate, ERIC/SMEAC

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time was spent in informal exploration. Students in the two treatment groups achieved about the same on tests of content done in the laboratory, except that average- and low-ability seventh graders did better in the Class Discovery Group. Both Laboratory and Class-Discovery Groups scored higher than students in the regular program on cumulative achievement, transfer, divergent-thinking, and attitude measures.

In a study with eight tenth-grade classes using geometry content, **White** found that inquiry lessons used with individualized teaching-learning units significantly increased critical thinking, achievement, and retention scores for average- and high-ability students. Laboratory lessons significantly increased achievement and retention scores for low- and average-ability students. Students in the laboratory group made the greater gain in scores for attitude toward mathematics.

Silbaugh studied 36 seventh-grade mathematics classes. Twelve classes attended multiple-activities laboratories twice a week during the school year; 12 classes were housed in the same school but did not attend the laboratories; 12 classes were in schools with no laboratories. The students who attended the laboratories appeared to achieve significantly higher on a standardized test.

In a 14-day study with eighth-graders, **Whipple** taught elementary concepts of metric geometry to two classes by a laboratory method emphasizing use of manipulative materials, while two classes used individualized instruction units. Students in the laboratory group scored higher on conventional written tests and showed better ability to compute areas and volumes using actual objects. No differences in spatial perception were found.

Johanson developed a nine-week curriculum for a ninth-grade class using apparatus and experiments which involve active manipulation, with game-playing, discussion, and children working in pairs or in small groups. The group taught with this curriculum scored higher on achievement and attitude measures than did a control group.

Dittmer presented responses to specific questions related to guidelines for developing a mathematics laboratory, from state supervisors and from teachers using a laboratory approach in grades 7-12.

Computers and Calculators: What Approach?

King conducted a formative pilot study with six ninth-grade classes. For five weeks, the general mathematics course was supplemented by one of three instructional procedures: mastery learning, or mastery learning and flowcharting with or without computer access. It was found that the low-achieving students could master the objectives of the unit particularly when flowcharting accompanied mastery learning.

Approximately 70 seventh-grade mathematics students worked in self-instructional booklets for 15 weeks, in a study by **Durall**. Upon completion of each booklet, the student was evaluated by direct contact with a computer through teletype terminals. If the criterion of 80 per cent was not attained, half of the students received remediation from an instructional sequence programmed into the computer. The other half received remediation from their teacher. Both groups achieved comparably, but remediation from the teacher appeared to be more supportive for low-ability students.

In studies previously summarized in Suydam (1972a), **Hatfield and Kieren** reported that use of computer programming as a problem-solving tool was especially helpful for average and above-average students in grade 7; in grade 11, it appeared best for average achievers.

Gaslin assigned six classes of ninth-grade general mathematics students to three treatments: a conventional algorithm set consisting of the usual textbook approach, used with or without a calculator, and an alternative algorithm set where each fractional operand was converted to a decimal, used with a calculator. Five mastery-learning units were used for an eight-week period. For low-ability or low-achieving children, the alternative algorithm with the calculator was found to be a "viable alternative" to the conventional algorithm with or without the calculator for promoting computational skill with positive rational numbers. Use of the calculator did not significantly affect performance with the conventional algorithm.

Objectives: Does Explicitness Help?

Loh investigated the use of behavioral objectives with two second-year algebra classes. Students who were informed of behavioral objectives did not learn or retain better than students not informed of objectives.

On the other hand, **Harris** found that, for four geometry and algebra classes, prescribed content with set daily goals, feedback, and systematic reinforcement increased achievement in each course.

Achievement: What is Students' Status?

Austin and Prevost reported that computation scores for eighth graders were lower in 1967 than in 1965 or 1963; different achievement tests were used, however. In grade 10, those students who had used "modern" or "transitional" textbooks in earlier grades scored higher on some subtests than did those who had used "traditional" textbooks.

Hammons found a significant decline in computational skills in eighth grades in Louisiana schools studied during 1960-1969, but a significant change in reasoning was not found.

Organization: How is Mathematics Learning Affected?

Gaskill studied the relationship between achievement and personal adjustment in middle schools and in junior high schools. Scores from 846 eighth graders from middle schools and 381 eighth graders from junior high schools indicated that differences in mean gain in achievement significantly favored the junior high school group. No differences in personal adjustment were found between the two organizational patterns.

Buchman studied low-achievers in ninth grade from schools providing only a two-semester algebra course, a three-semester course for low achievers and "slow workers," or a four-semester course. He found no differences in achievement, but some affective aspects were better in the lengthened courses.

Personality: What Characteristics Affect Mathematics Learning?

May identified students as "sensing" or "intuitive" personality type. The 295 eighth graders' scores on achievement and attitude measures were then compared. A

significant difference in computation, concepts, and applications scores was found between sensing and intuitive types. No differences in attitudes toward mathematics were found. May concluded that teachers should consider type of personality when planning instruction.

Gregory studied 20 teachers and their seventh-grade classes. He had one of each teacher's classes audio-taped five times, and administered a reasoning test to students at the beginning and end of the semester. The teachers were ranked on the basis of analysis of the frequency of their conditional moves: that is, how often did they use "if-then" language in their teaching. Students of teachers who used such language more frequently outperformed students of teachers who made fewer such statements, on the reasoning tests. Thus the teacher, through **use** of logical language in a variety of situations, can help students to develop greater achievement in logic.

Wolfe listed eight strategies observed being used by 11 mathematics teachers in grades 9 and 10 in an investigation of the verbal activity or "justification" as it is carried out in the classroom. Criteria for identifying justification ventures and "moves" in such ventures were also noted.

Cooney and Henderson attempted to identify methods of instruction which prove effective in helping students to structure their knowledge; that is, to organize in a meaningful way the concepts, facts, and principles they learn. From audiotapes of 44 instances of mathematics teaching by ten teachers in grades 7 through 12, they identified nine organizing relations: set membership, set inclusion, analysis, specifying, characterizing, explaining, implicating, generalizing, and abstracting. These are described: teachers might find it interesting to check these descriptions and compare them with their own classroom procedures.

* A complete annotated listing of studies published during 1972 is available from ERIC/SMEAC. The listing will also appear in the November 1973 issue of the *Journal for Research in Mathematics Education*.

LIST OF SELECTED REFERENCES**

Austin, Gilbert R. and Prevost, Fernand. Longitudinal Evaluation of Mathematical Computational Abilities of New Hampshire's Eighth and Tenth Graders, 1963-1967. *Journal for Research in Mathematics Education* 3: 59-64; Jan. 1972.

Buchman, Aaron L. Some Relationships Between Length of Courses in Elementary Algebra and Student Characteristics. (State University of New York at Albany, 1972.) *DAI* 33A: 2812; Dec. 1972.

Cooney, Thomas J. and Henderson, Kenneth B. Ways Mathematics Teachers Help Students Organize Knowledge. *Journal for Research in Mathematics Education* 3: 21-31; Jan. 1972.

Dittmer, Karen Ann. Guidelines for Developing a Mathematics Laboratory. (University of Alabama, 1971.) *DAI* 32A: 5083-5084; Mar. 1972.

Durall, Edwin Phillip. A Feasibility Study: Remediation by Computer Within a Computer-Managed Instruction Course in Junior High School Mathematics. (The Florida State University, 1972.) *DAI* 33A: 2611-2612; Dec. 1972.

Fennema, Elizabeth H. Models and Mathematics. *Arithmetic Teacher* 19: 635-640; Dec. 1972.

Gaskill, Lynn Dale. An Investigation of the Effects of Four Middle School Programs Upon Academic Achievement and Personal Adjustment of Eighth Grade Students. (North Texas State University, 1971.) *DAI* 32A: 3607; Jan. 1972.

Gaslin, William Lee. A Comparison of Achievement and Attitudes of Students Using Conventional or Calculator Based Algorithms for Operations on Positive Rational Numbers in Ninth Grade General Mathematics. (University of Minnesota, 1972.) *DAI* 33A: 2217; Nov. 1972.

Gregory, John William. The Impact of the Verbal Environment in Mathematics Classrooms on Seventh Grade Students' Logical Abilities. (The Ohio State University, 1972.) *DAI* 33A: 1585; Oct. 1972.

Hammons, Donald Wayne. Student Achievement in Selected Areas of Arithmetic During Transition from Traditional to Modern Mathematics (1960-1969). (The Louisiana State University and Agricultural and Mechanical College, 1972.) *DAI* 33A: 2237; Nov. 1972.

Harris, Jasper William. An Analysis of the Effects of Using Quizzes and Modified Teaching Procedures to Increase the Unit Test Scores in Geometry, Algebra, and French Classes in an Inner City Senior High School. (University of Kansas, 1972.) *DAI* 33A: 2648; Dec. 1972.

Hatfield, Larry L. and Kieren, Thomas E. Computer-Assisted Problem Solving in School Mathematics. *Journal for Research in Mathematics Education* 3: 99-112; Mar. 1972.

Johanson, Emma Jane Dixon. A Ninth Grade Piagetian Mathematics Curriculum. (The University of Toledo, 1972.) *DAI* 33A: 223; July 1972.

King, Donald Thomas. An Instructional System for the Low-Achiever in Mathematics: A Formative Study. (The University of Wisconsin, 1972.) *DAI* 32A: 6743; June 1972.

Kuhfittig, Peter Kurt Friedrich. The Effectiveness of Discovery Learning in Relation to Concrete and Abstract Teaching Methods in Mathematics. (George Peabody College for Teachers, 1972.) *DAI* 33A: 1323; Oct. 1972.

Loh, Elwood Lockert. The Effect of Behavioral Objectives on Measures of Learning and Forgetting on High School Algebra. University of Maryland, 1972.) *DAI* 33A: 145; July 1972.

May, Daryle Cline. An Investigation of the Relationship Between Selected Personality Characteristics of Eighth-Grade Students and Their Achievement in Mathematics. (The University of Florida, 1971.) *DAI* 33A: 555; Aug. 1972.

Shoecraft, Paul Joseph. The Effects of Provisions for Imagery Through Materials and Drawings on Translating Algebra Word Problems, Grades Seven and Nine. (The University of Michigan, 1971.) *DAI* 32A: 3874-3875; Jan. 1972.

Silbaugh, Charlotte Vance. A Study of the Effectiveness of a Multiple-Activities Laboratory in the Teaching of Seventh Grade Mathematics to Inner-City Students. (The George Washington University, 1972.) *DAI* 33A: 205; July 1972.

Suydam, Marilyn N. *A Review of Research on Secondary School Mathematics*. Columbus, Ohio: ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, Mar. 1972.

Suydam, Marilyn N. From the Research of 1971 on Secondary School Mathematics. In Mathematics Education Newsletter, Volume 4, Number 2. Columbus, Ohio: ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, 1972.

Vance, James H. and Kieren, Thomas E. Mathematics Laboratories—More than Fun? *School Science and Mathematics* 72: 617-623; Oct. 1972.

Waters, William Meade, Jr. A Study to Test the Effectiveness of a Circular Geoboard as an Instrument for Teaching Selected Arc-Angle Theorems. (The Florida State University, 1971.) *DAI* 32B: 6530-6531; May 1972.

Whipple, Robert M. A Statistical Comparison of the Effectiveness of Teaching Metric Geometry by the Laboratory and Individualized Instruction Approaches. (Northwestern University, 1972.) *DAI* 33A: 2699-2700; Dec. 1972.

White, Virginia Taffinder. An Evaluation Model to Test Teaching-Learning Units for Individualized Instruction in Mathematics. (University of Washington, 1972.) *DAI* 33A: 2247-2248; Nov. 1972.

Wolfe, Richard Edgar. Strategies of Justification Used in the Classroom by Teachers of Secondary School Mathematics. *School Science and Mathematics* 72: 334-338; Apr. 1972.

** "DAI" refers to *Dissertation Abstracts International.*

News Notes

NCTM's New Address

The new address of the National Council of Teachers of Mathematics is: 1906 Association Drive, Reston, Virginia 22091. NCTM moved into the new building in April; the formal dedication was early in May. It is one of the first buildings in a new educational park setting.

International Symposia Coming Up

The Second International Congress on Mathematical Education (ICME) was held at Exeter University in England during late summer, 1972. That Congress exhibited a strong interest in discussion of aspects of mathematical education on a wide international scale. The International Commission on Mathematical Instruction (ICMI) responded by giving sponsorship to international symposia, some of which are listed here for the benefit of American mathematics educators. For information concerning particular symposia, please write directly to the person and addresses listed.

(1) **Poland.** Symposium at Warsaw; 1974.

Main Subject: Mathematics in Primary Schools (Children from 6 to 11 years of age.)

Professor Z. Semadeni, Institute of Mathematics, Polish Academy of Sciences, UL. Sniadeckich 8, Warszawa 1, Poland.

(2) **Africa.** Regional Conference. Probably Nairobi, 1974.

Main Subject: Interactions between mathematical education and linguistics.

Dr. D. Saint-Rossy, UNESCO House, Malik Street, PO Box 30592, Nairobi, Kenya.

(3) **Japan.** ICMI-JSME Tokyo Conference: 1974. Preliminary proposal: 5-9 November, 1974;

Main Subject: Curriculum and teachers' training.

Professor S. Iyanaga, 12-4, Otsuka 6-Chome, Bunkyo-Ku, Tokyo, Japan.

(4) **India.** Regional Conference; late 1974.

Main Subject: The Development of an integrated curriculum in mathematics for the underdeveloped countries.

Professor P. L. Bhatnagar, Dean of Studies, Department of Mathematics, Himachal Pradesh University, Simla 5, India.

Computer Searches

Computer searches of the ERIC document base are available from various concerns. Here is some information on several:

* Systems Development Corporation has developed a service for searching the ERIC files from a terminal in your own office. Documents may be requested by accession number, clearinghouse code, author, title, publication date, descriptors, identifiers, institution or source of origin, sponsoring agency, and/or issue. Multiple categories may be selected within a single request. If a printout of all items found in a search is desired, it can be accomplished on-line at the terminal, or off-line, which saves terminal time costs. Off-line printed items are air-mailed to your address the same day as requested. For further information, write:

System Development Corporation
SDC/ERIC Search Service, Room 3113
2500 Colorado Avenue
Santa Monica, California 90406

* The New England Research Applications Center (NERAC) at the University of Connecticut is disseminating retrospective and selective information from the ERIC files. Users of the search service will be given assistance in instructing and implementing searches. For further information, write:

Dr. Daniel U. Wilde
Director, New England Research Applications Center
Mansfield Professional Park
Storrs, Connecticut 06268

* The Resource Information Center has available a low-cost computer software package for searching the ERIC files. The first phase locates and prints a list of accession numbers. The second phase prints abstracts and other selected information found in **RIE** and **CIJE**. The software package can be installed on any IBM 360 from a Model 30 upwards. For further information, write:

Edward Krahmer, or Kent Horne
Resource Information Center
Box 8009 University Station
Grand Forks, North Dakota 58201

* Oregon Total Information System (OTIS) will do ERIC subject searches for institutions, on ERIC records dated 1969 or later. The logical operators "or," "and," "and not" may be used, with no more than 20 descriptors. Up to 130 citations can be printed. For further information, write:

Benjamin L. Jones
OTIS
354 East 40th Avenue
Eugene, Oregon 97405

CENTER CLIPPINGS...

These documents are some of those announced in Research in Education during June or July 1973.

ED 072 544 EA 004 877
McGrady, Donna S.
Open Space Elementary Schools: An Annotated Bibliography.
Indiana State Univ., Terre Haute. Curriculum Research and Development Center.
Pub Date Jan 73
Note—24p.
Available from—Curriculum Research and Development Center, Jamison Hall, School of Education, Indiana State University, Terre Haute, Indiana 47809 ($1.00)
EDRS Price MF-$0.65 HC-$3.29
Descriptors—*Annotated Bibliographies, Building Design, *Classroom Furniture, *Elementary Schools, Literature Reviews, Newsletters, *Open Plan Schools, Research, *School Architecture, Space Utilization
This bibliography brings together most of what has been written about open space elementary schools since 1968. The citations are categorized as (1) general, (2) research, (3) schools, (4) furniture, (5) newsletters, or (6) bibliographies. Articles and bound materials are entered alphabetically in the most appropriate section. No attempt was made to include literature dealing with the educational programs that may take place in open space. Prices and addresses have been included when applicable. (Author)

ED 072 599 EC 051 118
Suppes, Patrick
A Survey of Cognition in Handicapped Children. Technical Report No. 197.
Stanford Univ., Calif. Inst. for Mathematical Studies in Social Science.
Spons Agency—Bureau of Education for the Handicapped (DHEW/OE), Washington, D.C.
Pub Date 29 Dec 72
Grant—OEG-0-70-4797(607)
Note—77p.
EDRS Price MF-$0.65 HC-$3.29
Descriptors—Aurally Handicapped, *Blind, *Cognitive Development, Concept Formation, *Deaf, *Exceptional Child Research, Language Ability, Mathematics, *Mentally Handicapped, Research Reviews (Publications), Visually Handicapped
Reviewed was research on the development of the cognitive skills of language, concept formation, and arithmetic in children handicapped by blindness, mental retardation, or deafness. Research on the language skills of the blind included a rejection of sensory compensation, while research on language in the retarded was seen to focus on linguistic variables and reading ability. Included among the research on language development of the deaf was research which was reported to suggest the value of early sign language training for cognitive development and the author's research on written language comprehension by the deaf. Research on concept formation in the blind found deficiencies in concept formation among the blind, while concept problems in the retarded were found to be in the areas of language control and verbalization rather than perception. Research on concept development in the deaf showed conflicting findings on whether a concept deficiency exists once verbal aspects are removed. Little research on arithmetic skills in the blind was reported, but one finding of skill development in the retarded showed better computation skills than normal children of the same mental age. The author's research found that the mathematical performance of deaf children was usually slightly higher than that of normal hearing children. (DB)

ED 074 110 TM 002 473
Ellis, E. N.
Survey of Achievement in Mathematics in Year Six of Vancouver Schools, May 29 - June 2, 1972.
Vancouver Board of School Trustees (British Columbia). Dept. of Planning and Evaluation.
Pub Date 22 Jun 72
Note—15p.; Research Report 72-11
EDRS Price MF-$0.65 HC-$3.29
Descriptors—*Achievement Tests, Comparative Analysis, Elementary School Mathematics, *Grade 6, Group Norms, *Mathematics, Tables (Data), Technical Reports, Test Results
Identifiers—Canada, *Vancouver
A survey test in mathematics was administered to all pupils (N=5,557) in grade 6 of Vancouver schools. The three parts of the test—computation, concepts, and problems, were given in separate sessions. The same test was given in 1969. The median scores in 1972 for the three subtests and for total score were somewhat lower than those in 1969. A larger number of students had perfect scores in 1972 than in 1969. Students above the 90th percentile performed slightly better than did their counterparts in 1969. Students in both years performed least well on the concepts subtest. Local norms and ranges of scores corresponding to letter grades are provided. (For related document, see TM 002 474.) (KM)

ED 074 154 TM 002 519
Knipe, Walter H. *Krahmer, Edward F.*
An Application of Criterion Referenced Testing.
Pub Date 27 Feb 73
Note—19p.; Paper presented at annual meeting of the American Educational Research Association (New Orleans, Louisiana, February 25-March 1, 1973)
EDRS Price MF-$0.65 HC-$3.29
Descriptors—Computer Assisted Instruction, *Criterion Referenced Tests, Elementary Grades, *Mathematics Instruction, *Performance Contracts, *Program Evaluation, Speeches, Teacher Attitudes, Technical Reports, Testing Programs
Criterion referenced testing has received considerable theoretical, but only limited practical, application. Grand Forks School District has developed mathematics criterion referenced tests for grades three to nine. The tests are keyed to a hierarchical set of approximately 50 performance objectives and 40 individualized contracts per grade level. These tests were administered on a pre-post basis during 1971-72. This study was designed to consider the following three concerns: (1) adoption experiences when using criterion referenced testing, (2) research conclusions as a byproduct of this testing, and (3) attitudes of classroom teachers to this method as compared to nationally formed tests. Data for the second concern indicate different orders and grade levels at which students learn specific skills in various schools. (Author)

ED 073 162 TM 002 411
Experiences With Sets and Numbers: Mathematics Evaluation Materials Package Project.
Ontario Inst. for Studies in Education, Toronto.
Pub Date 72
Note—102p.; Curriculum Series/14
Available from—Ontario Institute for Studies in Education, 252 Bloor Street West, Toronto 5, Ontario (no price quoted)
Document Not Available from EDRS.
Descriptors—Criterion Referenced Tests, *Educational Objectives, *Evaluation Methods, Grade 4, Grade 5, Grade 6, Instructional Design, *Mathematics Education, *Performance Tests, Student Testing, *Test Construction
Identifiers—Canada, *Mathematics Evaluation Materials Package, MEMP, Ontario
The Mathematics Evaluation Materials Package (MEMP)is a set of objectives and companion test items for mathematics education in Grades 4 to 6. The educational objectives are stated in terms of student performance and are coupled with companion test items. In this package are some companion items for objectives that are commonly used for the topic, "Experiences with Sets and Numbers," in Grades 4 to 6 in Ontario schools. Answers to the test items are provided. Sample inventories made up of models of types of papers that can be prepared by teachers by combining various items are provided. MEMP can be used to design tests covering short units of work or for constructing longer tests. (DB)

ED 073 553 24 EA 004 943
Course Goals in Mathematics, Grades K-12. Critique Draft.,
Multnomah County Intermediate Education District, Portland, Oreg.
Spons Agency—National Center for Educational Research and Development (DHEW/OE), Washington, D.C. Regional Research Program.; Oregon State Board of Education, Salem.
Bureau No—BR-2-J-032
Pub Date 72
Contract—OEC-X-72-0026(257)
Note—184p.; Tri-County Goal Development Project
Available from—Hard copy is not available
EDRS Price MF-$0.65 HC Not Available from EDRS.
Descriptors—Course Content, *Course Objectives, *Curriculum Development, Development, Educational Accountability, Educational Objectives, *Mathematics, *Mathematics Curriculum, *Mathematics Education, Public Schools
This document is one part of a critique series that deals with the development and evaluation of course goals in six subject matter areas for grades K-12. The series provides an initial pool of course-level goals that are expected to be of considerable value in assisting educators with goal definition related to curriculum planning and development, instruction, evaluation, and accountability. Goals for the mathematics curriculum are organized according to a subject matter taxonomy. Number systems goals are divided into goals for whole numbers, integers, rational numbers, real numbers, complex numbers, matrices and determinants, vectors, and algebraic expressions. Goals for numeration, mathematical sentences and their solutions, relations and functions, geometry, measurement, sets, logic, probability and statistics, history of mathematics, and use of computational devices are also presented. Four sets of indexes offer the possibility of retrieving course goals by subject matter, knowledge and process, subject area, and career education. Related documents are EA 004 941-2, EA 004 943-948, and ED 061 043. (Author/DN)

The list of subscribers to **Investigations in Mathematics Education** is continuing to grow. In the journal are abstracts and analyses of recent research reports in mathematics education. For further information about subscriptions to **Investigations in Mathematics Education**, write:

Jon L. Higgins, Editor
Investigations in Mathematics Education
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The Ohio State University
1945 North High Street
Columbus, Ohio 43210

Incidentally, some printing problems delayed the publication of Volume 6, Number 2; subscribers should receive their copies soon. Volume 6, Number 3 is now at the printers.

Oops!

In the last issue of this Newsletter (Vol. 5, No. 2), two errors have been found in the review of "Research on Elementary School Mathematics, 1972." First, on page 1, Weaver (1972) reported data from 23 **schools**: that means 135 classes, instead of the 23 stated. And on page 2 is a similar error: in Kratzer's (1972) study a total of 12 classes were involved. Apologies are offered for the inadvertent diminishing of the scope of these studies—and thanks go to the two authors for calling attention to the erroneous information.

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